

ifm electronic

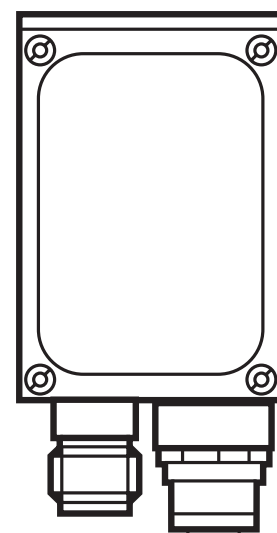


Operating instructions  
Multicode Reader

**efector190<sup>®</sup>**

UK

**O2I10x**



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### Open source software



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For software subject to the GNU General Public License or the GNU Lesser General Public License the source code can be requested against payment of the copying and shipping costs.

# 1 Preliminary note

## 1.1 Verwendete Symbole

- ▶ Instruction
- > Reaction, result
- [...] Designation of pushbuttons, buttons or indications
- Target, reference
-  Important note:  
Non-compliance can result in malfunctions or interference.
-  Information  
Supplementary note

## 1.2 Warning signs used

### **WARNING**

Warning of serious personal injury.  
Death or serious irreversible injuries may result.

### **CAUTION**

Warning of personal injury.  
Slight reversible injuries may result.

### **NOTE**

Warning of damage to property.

# 2 Safety instructions

These instructions are part of the device. They contain texts and drawings concerning the correct handling of the device and must be read before installation or use.

Observe the operating instructions.

Non-observance of the instructions, operation which is not in accordance with use as prescribed below, wrong installation or handling can affect the safety of people and machinery.

The installation and connection must comply with the applicable national and international standards. Responsibility lies with the person installing the unit.

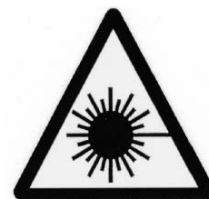
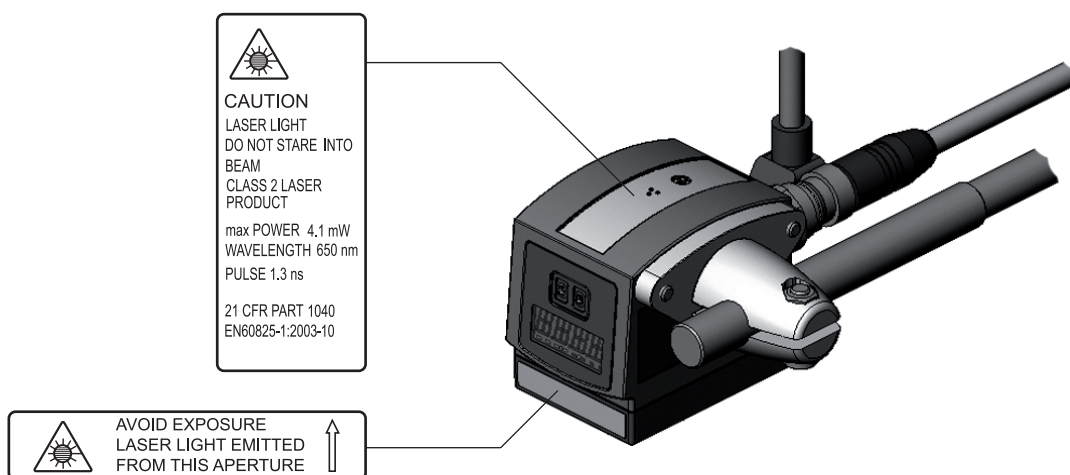
Only the signals indicated in the technical data or on the device label may be supplied to the connections or wires.

**⚠ WARNING**

Visible laser light; laser protection class 2.

Use of controls or adjustments other than those specified herein may result in hazardous radiation exposure. Damage to the retina is possible.

- ▶ Do not stare into the laser beam!
- ▶ Apply the enclosed labels (laser warning) in the immediate vicinity of the unit.
- ▶ Adhere to the caution and warning notes on the product label.
- ▶ Use the enclosed label for the power supply cable.

**UK****Label for power supply cable****Laser warning****Product label**

### 3 Items supplied

1 Multicode Reader O2I10x

The device is supplied without installation/connection accessories and software.

#### 3.1 Accessories

[www.ifm.com](http://www.ifm.com) → Data sheet direct: → e.g. O2I102 → Accessories

#### 3.2 Available software

[www.ifm.com](http://www.ifm.com) → Service → Download → Identification systems

### 4 Functions and features

The device decodes labelled and directly marked 2D codes and 1 D bar codes.

#### 4.1 Features at a glance

- integrated, configurable code evaluation
- process interfaces RS-232, Ethernet TCP/IP and EtherNet/IP
- parameter setting interface Ethernet TCP/IP and UDP/IP
- internal illumination red light (625 nm) or infrared (850 nm)
- internal or external triggering

Detailed information → 11 Technical data

### 5 Installation

#### 5.1 Mounting accessories

The device is compatible with the mounting accessories of ifm's photoelectric sensors of the O2Dxxx (object recognition), O2Mxxx (EthernetCamera) etc. series.

Example mounting with clamp and bracket:



Depending on the intended location and type of mounting the following mounting accessories are available:

Description	Art. no.
Mounting set for shaft Ø 12 mm (clamp and bracket for types O2Dxxx, O2Mxxx, O2Ixxx)	E2D110
Shaft, straight Ø 12 mm, length 130 mm, M10	E20938
Shaft, angled Ø 12 mm, length 200 mm, M10	E20940
Mounting set for shaft Ø 14 mm (clamp and bracket for types O2Dxxx, O2Mxxx, O2Ixxx)	E2D112
Shaft, straight Ø 14 mm, length 130 mm, M12	E20939
Shaft, angled Ø 14 mm, length 200 mm, M12	E20941

You can find more information about the available accessories at:

[www.ifm.com](http://www.ifm.com) → Data sheet direct: → e.g. O2I102 → Accessories  
or directly

[www.ifm.com](http://www.ifm.com) → Data sheet direct: → e.g. E2D110

## 5.2 Mounting dimensions

The device is mounted using 2 M4 screws and nuts.  
Hole dimensions → 10 Scale drawing.

### 5.3 Installation location

**NOTE**

High-energy lasers (class 3 and above) could destroy the image sensor if they impinge on the lens.

- ▶ Do not position the unit in the immediate vicinity of high-power lasers.
- ▶ Use a laser screen or filter if the lens of the unit cannot be protected from high-energy lasers.

You can find more information about the available accessories at:

[www.ifm.com](http://www.ifm.com) → Data sheet search → e.g. O2I102 → Accessories

- ▶ Mount the camera in front of or above the area to be monitored.  
The detectable field of view size depends on the operating distance → 11 Technical Data.
- ▶ Back light or scattered light situations and continuously changing light conditions are to be avoided.
- ▶ Do not position illumination elements directly facing the camera lens.
- ▶ To avoid adverse effects on the image detection, avoid installation in heavily polluting areas of the machine.
- ▶ The connected cables must be provided with a strain relief.

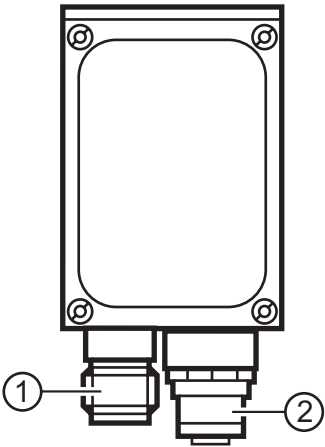
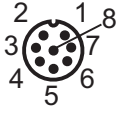



## 6 Electrical connection

### NOTE

The unit must be connected by a qualified electrician.  
Disconnect power before connecting the unit.

### 6.1 Wiring

	Process interface (1)	
	M12 connector, A-coded, 8 poles	
		1 U+ 2 trigger input, positive switching 3 0 V 4 trigger output/switching output 1, positive switching (code evaluation) 5 RxD RS-232 6 TxD RS-232 7 switching output 2 (ready), positive switching 8 GND RS-232 (electrically separated up to 50 V)
	Parameter/process interface (2)	
	M12 socket, D-coded, 4 poles	
		1 Ethernet TxD + 2 Ethernet RxD + 3 Ethernet TxD - 4 Ethernet RxD -

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For information about available sockets/connectors see:

[www.ifm.com](http://www.ifm.com) → Product line → Accessories

### 6.2 External illumination

- Connect external illumination to the trigger output of the device.

Example	Art. no.
Illumination unit, transmitter red light 630 nm	O2D909

For information about the a.-m. example see:

[www.ifm.com](http://www.ifm.com) → Data sheet direct: → O2D909

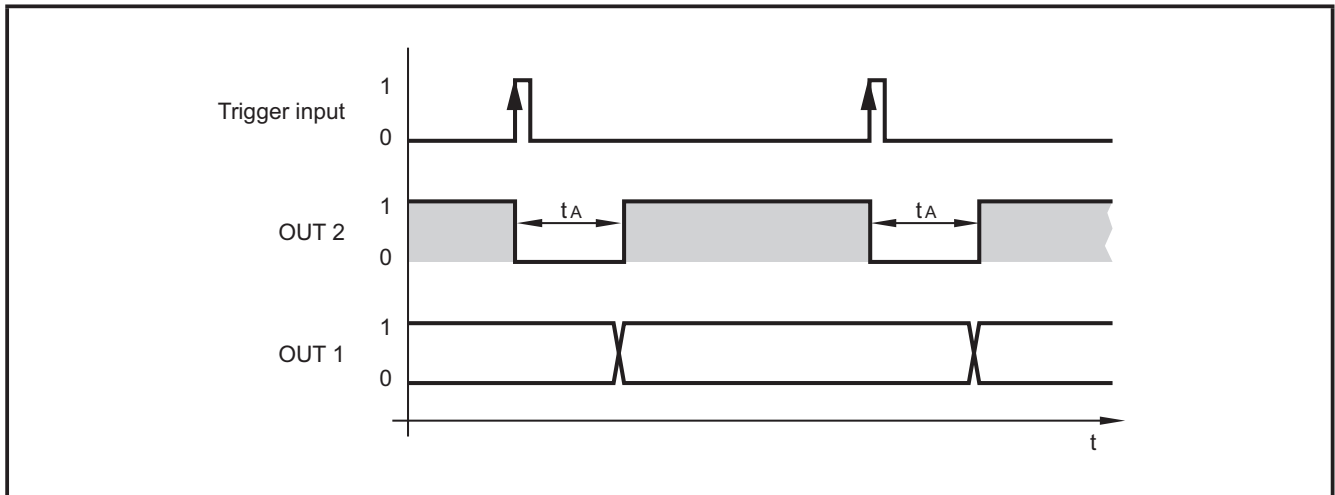
### 6.3 External trigger source

- Connect an external trigger source (e.g. a diffuse reflection sensor) to the trigger input of the device.

For information about available articles see:

[www.ifm.com](http://www.ifm.com) → Product line

### 6.3.1 Timing diagram



Example: Triggering positive edge

		Standard	External illumination	Via process interface
OUT2	Switching output 2	Ready signal 0: Device busy 1: Device ready for trigger signal	Ready signal 0: Device busy 1: Device ready for trigger signal	Selectable via command
OUT1	Switching output 1	Code evaluation 0: Code evaluation not successful 1: Code evaluation successful	Trigger output	

Evaluation times  $t_A$ : 50...200 ms

The times depend for example on the image preprocessing time.

### 6.4 Process interface RS-232 (factory setting)

Bits per second: 9,600 bits/s  
 Data bits: 8  
 Parity: none  
 Stop bits: 1  
 Flow control: none

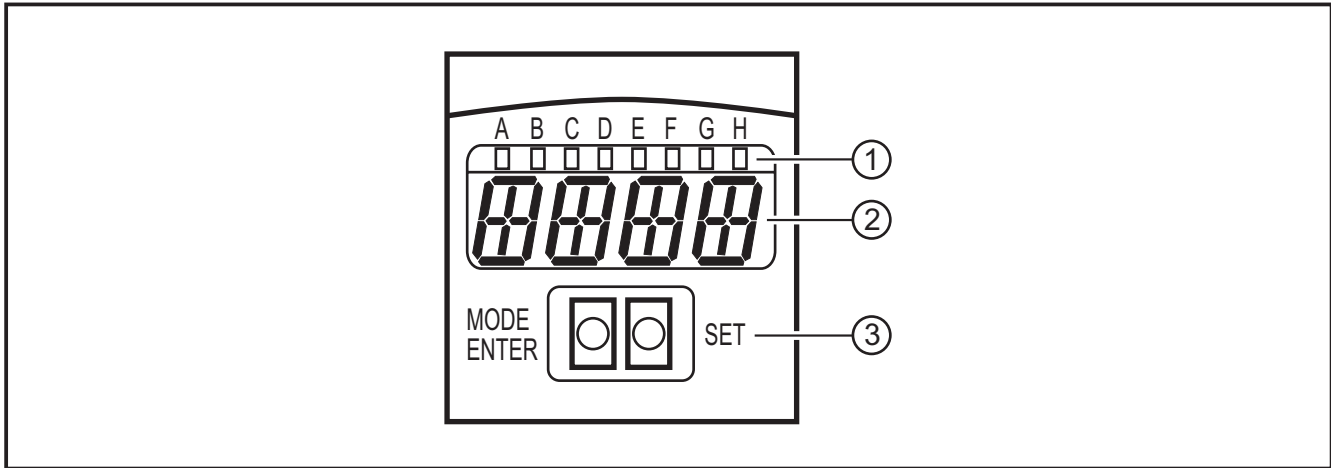
### 6.5 Process interface TCP/IP, EtherNet/IP

RS-232, TCP/IP or EtherNet/IP can be selected in the PC operating program at "Global settings" → Programming manual E2I200.

Pushbutton-controlled selection is not possible.

## 7 Operating and display elements

### 7.1 View of the unit



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1. LEDs (Function display)
2. Display (Operation indication/dialogue/parameters)
3. Pushbuttons (Parameter setting)

### 7.2 LEDs

LED	Name	Colour	Status	Meaning
A	power	green	on	supply voltage applied device ready for operation
			flashing (2 Hz)	no configuration saved in the device (factory setting)
			flashing (20 Hz)	device fault
B	Eth	green	on	Ethernet connection exists
			flashing	Ethernet signal
C	Con	green	on	connected with PC operating program
D	–	–	–	not used
E	TxD	yellow	off / flashing	RS-232 TxD status
F	RxD	yellow	off / flashing	RS-232 RxD status
G	1	yellow	on	switching output 1 switched code evaluation successful
			flashing (20 Hz)	short circuit switching output 1
H	2	yellow	on	switching output 2 switched (ready signal) device ready for next trigger signal
			flashing (20 Hz)	short circuit switching output 2

## 7.3 Display

### 7.3.1 Operation indication

Display	Meaning
ui05	Version number of the IO controller software (1st indication after power on)
Init	Device initialisation (2nd indication after power on)
nnnn	Firmware version, e.g. 3009 (3rd indication after power on)
rEdY	Device ready for trigger (4th indication after power-on if one configuration is active with external triggering. Device waiting for triggering.)
WAIT	No active/valid configuration available Unit is busy (4th indication after power-on if no configuration is active or valid = on delivery)
nr28	Configuration number after successful code evaluation
SCAN	Indication with internal triggering until a code has been found
run	Device is waiting for the connection, no active configuration or group
LOAd	Loading a new configuration
donE	Loading a new configuration terminated (indication 1 s)
uLoc	Pushbuttons unlocked parameter values can be displayed and changed
Lok1	Pushbuttons locked parameter values cannot be displayed and changed
Lok2	Pushbuttons locked parameter values can be displayed but not changed
FWUP	Firmware update running

### 7.3.2 Connection via operating program

Display	Meaning
OnLI	Configuration mode
Parm	Creating or modifying a configuration
Moni	Monitor mode
SerP	Service mode

### 7.3.3 Error messages

Display	Meaning
FAIL	Last code evaluation not successful

Display	Meaning
ErrT	Temperature of the device too high or too low
ErrD	Fatal device error
SC	Short circuit of a switching output
DHCP noIP	No DHCP server found. Both character strings are displayed alternately.

Parameter designations → 8.2.2 Parameter structure

## 7.4 Pushbuttons

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Button	Function
MODE/ENTER	Change to the parameter setting mode Selecting the parameters Confirming the parameter values
SET	Selecting the subparameters Setting/changing/selecting the parameter values - incremental by pressing briefly - scrolling by holding pressed

## 8 Setup

Depending on the application and the code quality, the device is set up via pushbutton-controlled parameter setting or via menu-guided PC operating software.

The device stores up to 32 configurations (= parameter sets).

A configuration consists of for example the type of image preprocessing, the exposure time or the format of the process data.

The settings of the process interface (baud rate, parity ...) cover all configurations.

### 8.1 Overview of possible parameter settings

With pushbutton-controlled parameter setting the partly predefined standard values are used (→ 8.2.3 Parameter description → tCod).

Parameter setting	Pushbutton-controlled without PC operating software	with PC operating software
Creating configurations	•	•
Administering, naming configurations	–	•
Grouping configurations	–	•
Switching laser marking on/off	•	•
Rotating/switching off display	•	–
Focusing	manual	manual
Image preprocessing	predefined	•
Code recognition	predefined	•
Process data	predefined	•
Trigger mode	predefined	•
Network settings	•	•
Selecting process interface RS-232, TCP/IP, EtherNet/IP	–	•
Querying firmware	•	•
Reset the device to factory setting	•	–

• = adjustable / – = not adjustable

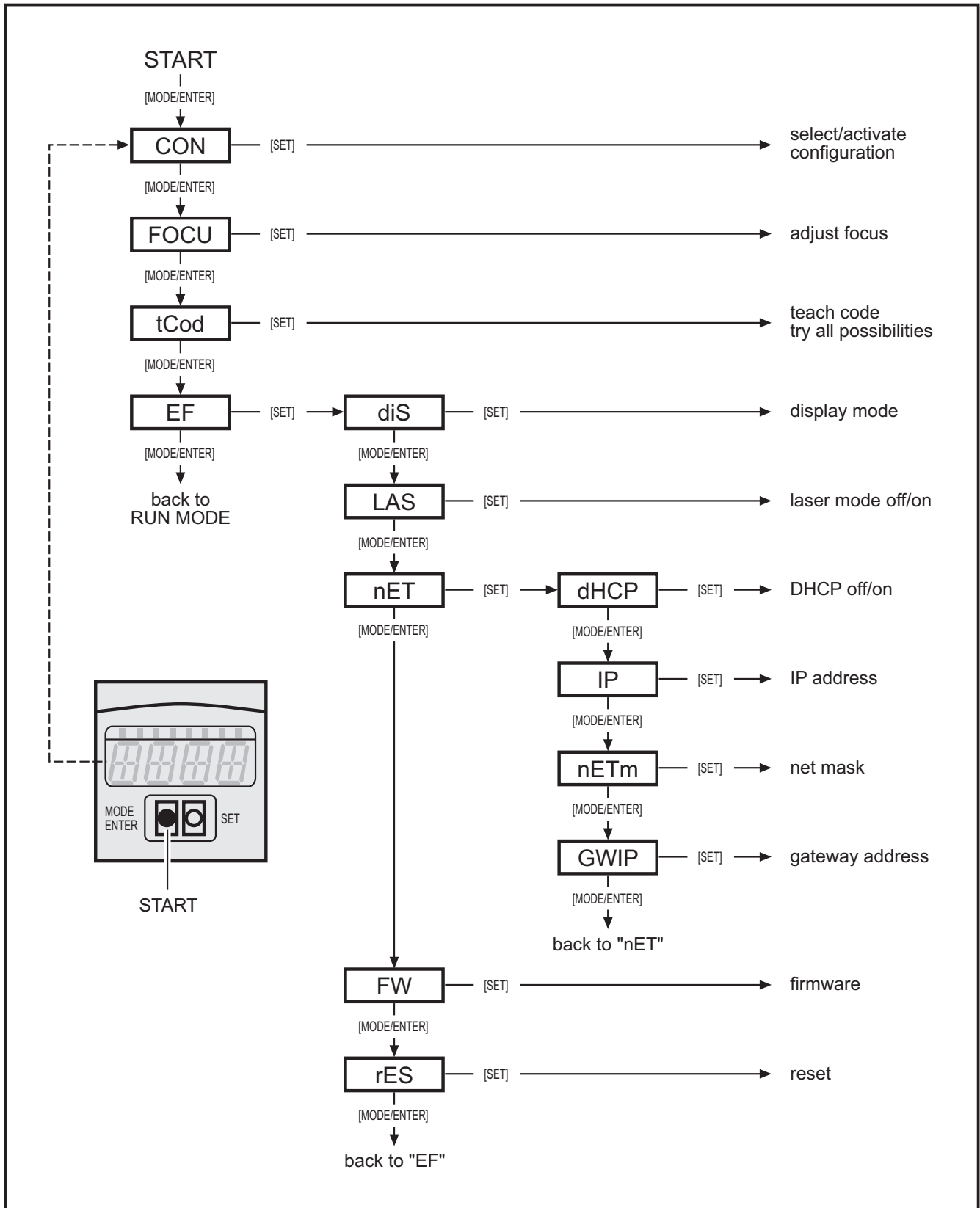
### 8.2 Parameter setting without PC operating software

The device parameters are set using the 2 buttons [MODE/ENTER] and [SET].

Basic principle:

1. Activate a parameter with [MODE/ENTER].
2. Display/set/select the parameter value with [SET].
3. Confirm the value with [MODE/ENTER].

## 8.2.1 Parameter structure



## 8.2.2 Parameter setting

### 1. Change to the parameter mode and activate parameters:

- ▶ Press [MODE/ENTER] 1 x.
- > The first parameter is displayed (CON).
- ▶ If necessary, press [MODE/ENTER] again until the requested parameter is displayed (CON, FOCU, tCod, EF).
- ▶ If necessary, activate subparameters with [SET] (e.g.: EF → diS)

### 2. Display/set/select the parameter value:

- ▶ Press [SET].
- > The current value or the current setting of the parameter is displayed.
- ▶ Press [SET] again and keep it pressed.
- > Display starts flashing (approx. 5 s)
- > Display stops flashing.
- ▶ Release [SET].
- ▶ Set/select the value with [SET] by pressing the button once or continuously by keeping the button pressed. Preset selection values are continuously passed through when the button is kept pressed (e.g.: off, on, off, on, etc.).

### 3. Confirm parameter value

- ▶ Confirm the displayed setting/selection with [MODE/ENTER].
- > Display changes to the output parameter.

If no button is pressed for 15 s, the device returns automatically to the respective output parameter (e.g. IP → nET → EF → evaluation mode). Settings that were not confirmed with [MODE/ENTER] are rejected.

## 8.2.3 Parameter description

Parameter			Description	Adjustable values: factory setting ( <u>x</u> )
CON			Configuration Creating/activating a configuration Numeric filing (0.01...0.32) <u>n</u> .nn group number (1...8) <u>n</u> . <u>nn</u> configuration number (1...32)	0. <u>01</u> F...0.32F
			Abbreviations: F: memory location free I: memory location used by an inactive application A: memory location used by the active application e.g. 0.14A = configuration 14, not assigned to any group, active	



Parameter			Description	Adjustable values: factory setting ( <u>x</u> )
<b>FOCU</b>			Focusing	—
			Manual setting of the lens via focal setter on the back of the device. The optimum definition is obtained once the max. possible value is displayed. Note: The value displayed does not relate to the actual operating distance. It is merely an internal operand.	
<b>tCod</b>			Teaching code	
	TEACH		Starting the teach process	
			The configuration via teaching is made using predefined standard values: <ul style="list-style-type: none"> <li>• trigger mode: once, positive edge</li> <li>• no image preprocessing with filters</li> <li>• code representation black on white, not mirrored</li> <li>• only one code is read in the image</li> <li>• internal illumination, all segments lit</li> <li>• sensor characteristics linear</li> <li>• exposure time is determined automatically</li> <li>• trigger output for illumination control</li> <li>• code search zone is full screen</li> </ul>	
			Indications/response (approx. 1 s): 1 = teach process successful (automatic change-over to parameter EF) 0 = teach process not successful (automatic return to parameter tCod)	
<b>EF</b>			Extended functions	
	diS		Display mode Rotate display by 180° or switch off in evaluation mode.	<u>norm</u> , USd, off
	LAS		Laser marking (laser pointer) The laser marking serves as alignment aid and is parallel to the optical axis. It is located approx. 2 cm above the middle of the field of view.	<u>off</u> , on
	nET		Network Parameters for network operation (DHCP, IP, nETm and GWIP). These parameters are intended for setup using the PC operating software or for use in another network.	

Parameter			Description	Adjustable values: factory setting (x)
		DHCP	<p>Dynamic Host Configuration Protocol</p> <p>Ensures dynamic assignment of an IP address using a DHCP server.</p> <p>With the setting "on" the device setting <b>must</b> be operated in a network with DHCP server. Otherwise it cannot be accessed via the PC operating software E2I200.</p> <p>With the setting "off" the fixed network settings (→IP, nETm, GWP) are used.</p>	<u>off</u> , on
		IP	<p>IP address</p> <p>Is used when the device does not operate in the DHCP mode.</p> <p>The input is made in the "dotted decimal notation", e.g. 192.168.000.079. The respective group is visualised by a letter in the first position of the display (A, B, C, D).</p> <p>After parameter selection the 4 groups are automatically displayed consecutively or can be activated and set with [SET].</p>	Annn. Bnnn. Cnnn. Dnnn <u>192.168.000.079</u>
		nETm	<p>Subnet mask</p> <p>Is used when the device does not operate in the DHCP mode.</p> <p>The subnet mask must match the IP address. It is input analogically to the input of the IP address.</p>	Annn. Bnnn. Cnnn. Dnnn <u>255.255.255.000</u>
		GWIP	<p>Gateway address</p> <p>Is used when the device does not operate in the DHCP mode.</p> <p>It is input analogically to the input of the IP address.</p>	Annn. Bnnn. Cnnn. Dnnn <u>192.168.000.201</u>
	FW		<p>Firmware</p> <p>Query of the installed firmware version.</p>	
	rES		<p>Reset</p> <p>Reset the device to factory setting (display mode, laser marking etc.).</p> <p>Note: Stored configurations remain unchanged.</p>	

### 8.2.4 Lock/unlock pushbuttons

- ▶ Press [MODE/ENTER] and [SET] simultaneously > 10 s.
- > The current setting is displayed (e.g. uLoc = pushbuttons unlocked).  
(→ 7.3.1 Operation indication)
- ▶ Select the requested setting with [SET].
- ▶ Confirm setting with [MODE/ENTER].
- > Setting is saved.
- > Device returns to the code evaluation mode.

### 8.2.5 Reset device to factory settings

- ▶ Activate the parameter "rES".
- ▶ Press [SET] > 5 s.

## 8.3 Parameter setting via PC operating software

The PC operating software is described in a separate document → Programming manual E2I200.

[www.ifm.com](http://www.ifm.com) → Data sheet direct → E2I200 → Additional data

# 9 Operation

## 9.1 Code evaluation

When the supply voltage has been applied, the unit is automatically in the evaluation mode. If an active configuration is stored on the device, it will perform the configured functions and create output signals according to the set parameters.

The display indicates the current evaluation result, the yellow LEDs signal the switching status of the outputs.

## 9.2 Process data protocol

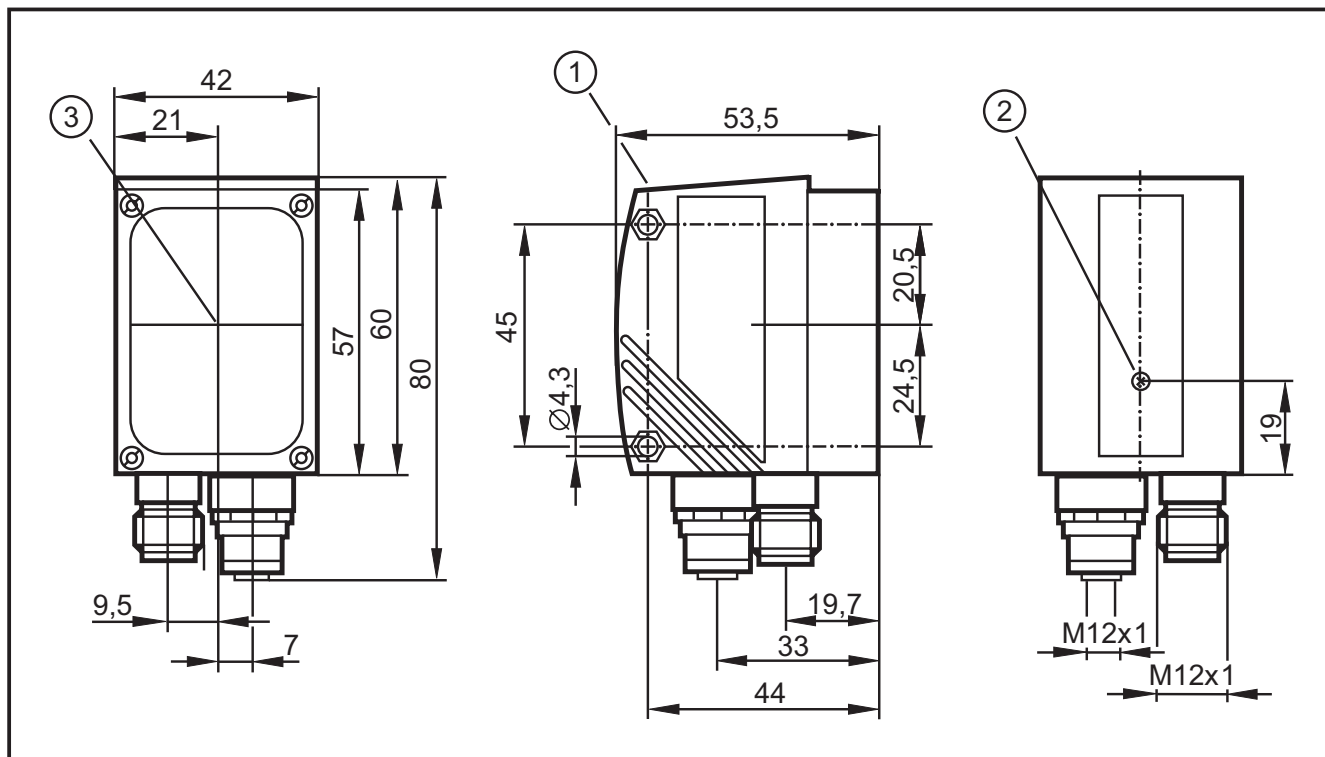
The process data protocol is part of the programming manual E2I200.

The programming manual E2I200 can be found at:

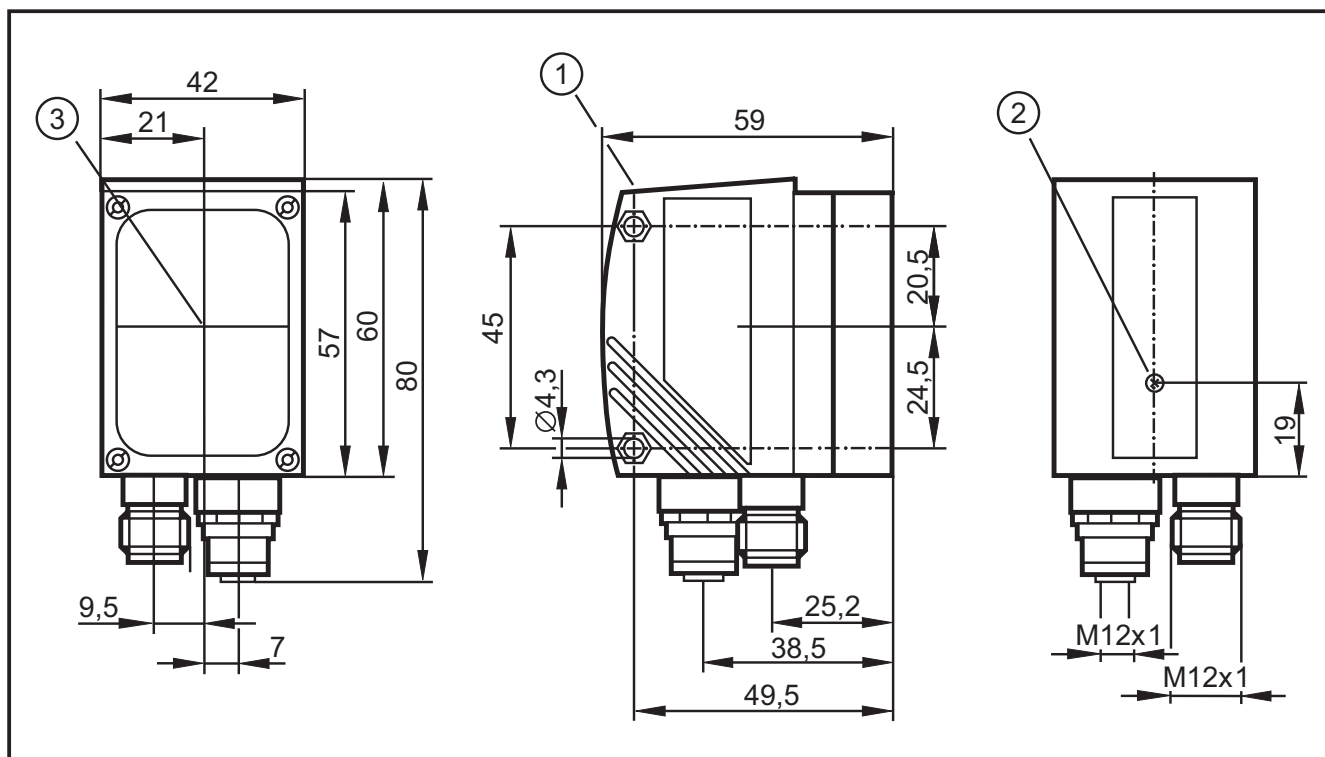
[www.ifm.com](http://www.ifm.com) → Data sheet search → E2I200 → Additional data

## 10 Scale drawing

### 10.1 O2I100, O2I101, O2I102, O2I103



### 10.2 O2I104, O2I105



1. Operating and display elements
2. Focal setter
3. Middle of the optical axis

## 11 Technical data

Type of sensor			CMOS image sensor black/white VGA resolution 640 x 480					
Readable codes			ECC200, PDF-417, QR Interleaved 2-of-5, Industrial 2-of-5, Code 39, Code 128, Pharmacode, Code 93, Codabar EAN13, EAN13-Add-On 2, EAN13-Add-On 5 EAN8, EAN8-Add-On 2, EAN8-Add-On 5 UPC-A, UPC-AAdd-On 2, UPC-AAdd-On 5 UPC-E, UPC-E Add-On 2, UPC-E Add-On 5 RSS-14, RSS-14 Truncated, RSS-14 Stacked, RSS-14 Stack Omnidirection, RSS Limited, RSS Expanded, RSS Expanded Stacked					
Operating distance		mm	50		100		200	
Field of view size	O2I100 O2I101	mm	20 x 14		36 x 26		68 x 50	
Field of view size	O2I102 O2I103	mm	46 x 32		77 x 56		140 x 100	
Operating distance		mm	75	100	200	400	1000	2000
Field of view size	O2I104 O2I105	mm	15 x 11	20 x 14	40 x 30	80 x 60	200 x 150	400 x 300
Omnidirectional reading			yes					
Inclination to the image plane			≤ 45°					
Readings			≤ 20/s					
Motion speed			≤ 7 m/s					
Function display			3 x LED green (Power, Ethernet, PC) 4 x LED yellow (RS-232, Out1/Trigger, Out2)					
Operation indication / dialogue			4-digit 10-segment display					
Possible parameter settings			via 2 pushbuttons and 10-segment display or via PC/notebook with operating software E2I200					
Laser marking			red, laser protection class 2 to DIN EN 60825-1					
Operating voltage			24 V DC (± 10%)					
Current consumption			< 300 mA					
Current rating			100 mA (per switching output)					
Voltage drop			< 2 V					
Short-circuit protection, pulsed			yes					
Overload protection			yes					
Reverse polarity protection			yes					

Material		housing: die-cast zinc, powder coating lens window: glass LED window: polycarbonate
Trigger (optional)		internal external (24 V PNP to IEC 61131-2, type 2) via RS-232, TCP/IP or EtherNet/IP
Number switching outputs		max. 2 (24 V PNP)
Internal illumination	<b>O2I100</b> <b>O2I102</b> <b>O2I104</b>	red light (625 nm) 4 lighting segments (individual control via PC operating program)
	<b>O2I101</b> <b>O2I103</b> <b>O2I105</b>	infrared (850 nm) 4 lighting segments (individual control via PC operating program)
Connection external illumination		24 V DC PNP
Process interfaces		RS-232: 9600...115200 bits/s Ethernet TCP/IP, EtherNet/IP: 10Base-T/100Base-TX
Parameter setting interface		Ethernet TCP/IP, UDP/IP
IP address		192.168.0.79
Subnet mask		255.255.255.0 (class C)
Gateway IP address		192.168.0.201
MAC address		see type label
Operating temperature		-10...50 °C
Storage temperature		-40...85 °C
Protection		IP 67, III
EMC		interference emission / immunity to DIN EN 61326
Mechanical tests		shocks to IEC 60068-2-27 vibration to IEC 60068-2-6

## 11.1 Module size specifications (ECC200)

### 11.1.1 General specifications

Image size O2I10x	640 x 480 pixels
Code size in the image	max. $\frac{2}{3}$ image size ( $\approx$ approx. 430 x 320 pixels)
Module size (standard recognition)	min. 6 pixels
Module size (extended recognition)	min. 2 pixels

### 11.1.2 Module size in dependence of the operating distance

Article no.	Operating distance	50	100	200
<b>O2I100</b> <b>O2I101</b>	Field of view size	20 x 14	36 x 26	68 x 50
	Module size (min.) Standard recognition	0.28	0.51	0.96
	Module size (min.) Extended recognition	0.09	0.17	0.32
<b>O2I102</b> <b>O2I103</b>	Field of view size	46 x 32	77 x 56	140 x 100
	Module size (min.) Standard recognition	0.65	1.08	1.97
	Module size (min.) Extended recognition	0.22	0.36	0.66

Values in mm

Article no.	Operating distance	75	100	200
<b>O2I104</b> <b>O2I105</b>	Field of view size	15 x 11	20 x 14	40 x 30
	Module size (min.) Standard recognition	0,21	0,28	0,56
	Module size (min.) Extended recognition	0,07	0,09	0,19
	Operating distance	<b>400</b>	<b>1000</b>	<b>2000</b>
	Field of view size	80 x 60	200 x 150	400 x 300
	Module size (min.) Standard recognition	1,13	2,81	5,63
	Module size (min.) Extended recognition	0,38	0,94	1,88

Values in mm

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## 12 Maintenance, repair and disposal

- ▶ Keep the lens window free from soiling.  
Soiling may considerably affect the reading result!
- ▶ To clean the lens window, do not use any detergents or solvents which might damage the front glass.
- ▶ Do not open the housing, as the device does not contain any components which must be maintained by the user. The device must only be repaired by the manufacturer.
- ▶ Dispose of the device in accordance with the national environmental regulations.

## 13 Approvals/standards

Test standards and regulations → 11 Technical data.

The CE Declaration of Conformity is available at:

[www.ifm.com](http://www.ifm.com) → Data sheet search: → e.g. O2I102 → Certificates



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